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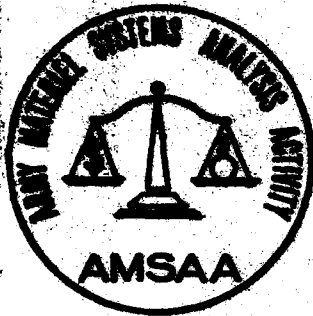   JUN 81 W H BRISENDINE

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LOGISTICS STUDIES OFFICE

PROJECT NUMBER 013

FINAL REPORT

FEASIBILITY OF SERIAL NUMBER CONTROL OF MAJOR ITEMS

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U. S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY

LOGISTICS STUDIES OFFICE

FORT LEE, VIRGINIA 23801

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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A115658	3. RECIPIENT'S CATALOG NUMBER

4. TITLE *(and Subtitle)*	5. TYPE OF REPORT & PERIOD COVERED
Feasibility of Serial Number Control of Major Items	Final Report
	6. PERFORMING ORG. REPORT NUMBER LSO Project 013

7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
Wilford H. Brisendine	

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Logistics Studies Office US Army Materiel Systems Analysis Activity Fort Lee, VA 23801	

11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
US Army Materiel Development & Readiness Command ATTN: DRCPS-S, 5001 Eisenhower Avenue Alexandria, VA 22333	June 1981
	13. NUMBER OF PAGES 39

14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*	15. SECURITY CLASS. *(of this report)*
	Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

The views, opinions, and/or findings contained in this report are those of the author and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Total Force; Supply; Major Items; Management and Control

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report discusses the six serial number reporting, control, and management systems used by the Army--Small Arms Accounting System, The Army Maintenance Management System (and its replacement, the Standard Army Maintenance System), the Aviation Component Intensive Management System, the Armament Management Information System-Logistics, the tail number control of aircraft, and the USA numbering system for vehicles. The conclusion is that there is no overlap or duplication between systems. The principal recommendation is that materiel
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FEASIBILITY OF SERIAL NUMBER CONTROL OF MAJOR ITEMS

LOGISTICS STUDIES OFFICE
PROJECT 013

FINAL REPORT
JUNE 1981

WILFORD H. BRISENDINE

LOGISTICS STUDIES OFFICE
US ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY
FORT LEE, VIRGINIA 23801

ABSTRACT

This report discusses the six serial number reporting, control, and management
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for management by serial number should be limited to those items which have
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EXECUTIVE SUMMARY

I. <u>Authority for the Study</u>. Letter, DRCPA-S, 6 February 1979, subject: Request for Logistics Studies, and Inclosure 1-E thereto.

II. <u>Problem Statement</u>. The Army uses six different systems for the collection of serial number data. The problem is that there may be overlap or duplication between the various systems.

III. <u>Objective</u>. This study was undertaken to review and compare capabilities and limitations of current and planned control systems, to develop criteria for designating those items which can be controlled/managed by serial number in a cost effective manner, and to develop a concept for one standard serial number management system.

IV. <u>Limits and Scope</u>. The study examines the Small Arms Accounting System, The Army Maintenance Management System (and its replacement, the Standard Army Maintenance System (SAMS)), the Aviation Component Intensive Management System (ACIMS), the Armament Management Information System-Logistics, the tail number control of aircraft, and the USA numbering system for vehicles. A determination of factors significant in the selection of items to be designated as appropriate for serial number control systems is included.

V. <u>Findings</u>. There is no need for issue of a DARCOM regulation covering the assignment of serial numbers. The greatest difficulty at the present time is in obtaining good data reported from the field. It is anticipated that the data will improve subsequent to implementation of the Standard Army Maintenance System.

VI. <u>Conclusions</u>. There is no overlap or duplication between the different serial number control/management systems. Each was designed for its own purpose and collects only data unique to that purpose.

VII. <u>Recommendations.</u> Materiel selected for management by serial number should be limited to those items that have a medium-to-high probability of being modified or modernized in future years and to those reparable items which require replacement or depot level maintenance after a prescribed period of usage. Design of one "standard" system is not necessary. After full implementation of SAMS in 1986, a determination should then be made concerning the practicality of absorbing all or part of ACIMS into the SAMS data base.

MAIN REPORT

I. Problem

Within the US Army Materiel Development and Readiness Com-
mand there are two distinct types of serial number control systems.
The first type is exemplified by the Small Arms Accounting System, a
Department of Defense-wide system for identifying the last regis-
tered owner of a serially numbered small arm. The second type is
exemplified by the Aviation Component Intensive Management System
and The Army Maintenance Management System in which the owner of the
item is identified and other data is provided to include such in-
formation as hours operated, miles driven, rounds fired, modifica-
tion work orders applied, and other management information. The
Armor Management Information System - Logistics uses this type of
data after purification by a comparison with the data from the Con-
tinuing Balance System - Expanded. Control of aircraft by tail
number is another type of management by serial number. The problem
is that there may be unnecessary overlap or duplication between the
various systems.

II. Objectives

The objectives of this study are to:

A. Review and compare capabilities and limitations of cur-
rent and planned control systems.

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B.   Develop criteria for designating those items which can be controlled/managed by serial number in a cost effective manner; and to develop a concept for one standard serial number management system.

III. Background

A. Item configuration

1.   The requirements of the Federal Catalog System specify that each item of supply have a unique configuration, and each item of supply be identified by a unique National Item Identification Number (NIIN). So, in theory at least, all items which have been given the same NIIN should have precisely the same item configuration. However, in the case of complex items, such as major end items, this is not always true. It would be advantageous if some kind of data were available so that the configuration of the major end item could be determined. The same situation exists to a lesser extent with secondary items, principally those that are reparable at the depot level or at special repair-activities. The following specific examples are offered for consideration.

2.   If there were a fleet of vehicle-mounted rocket launchers, all powered by gasoline engines and identical in all other aspects, only one National Item Identification Number should be assigned for the item. If a modification were developed to replace some of the gasoline engines with diesel engines, an additional item description should be submitted and a new National Item

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Identification Number obtained for the diesel-powered model. In this way the National Item Identification Number itself controls the integrity of the item configuration to a large degree.

3. The previous example tends to oversimplify matters. An M60 series tank can be equipped with either of three types of rangefinders--optical, infrared, or laser. Regardless of which rangefinder is installed, the tank still carries the same National Item Identification Number, so that in practice we cannot distinguish between those tanks requiring repair parts for optical rangefinders, infrared rangefinders, or laser rangefinders. In fact, none of the serial number reporting systems currently in use will provide the level ⅽf detail necessary to describe all the variations possible in a very complex item.

4. This study examines the use of serial number reporting and other means of getting enough configuration and usage data to the managing command so that the information can be used for management decisions.

B. Readiness

Readiness is related to item configuration. A major end item which has had all necessary modification work orders applied is generally more available and more reliable than the same item lacking any of the modifications. Readiness is also related to the failure of secondary items and principal components within the end

item and such failure is largely a function of age, mileage incurred, rounds fired, or hours flown. Readiness is reported in accordance with AR 220-1, but the readiness report is an exception type of reporting and is not considered a part of the serial number reporting systems, since only those serial numbers of items which are in some way deficient are reported.

IV. Limits and scope

A. The definition of serial number control or management, as it pertains to this study, is the making of management-type decisions at the materiel readiness commands or higher headquarters based upon data from an item population, this data being collected and filed by the serial number of each item in the population. Examples of these decisions are: (1) requirements determination for vehicles based partially upon age/mileage categories as derived from the reported data; (2) research, development and procurement of follow-on items based upon condition of present items; (3) depot level overhaul forecasts predicated on condition or hours of use; (4) forecasts of disposal actions; and (5) distribution direction of replacement items or support items influenced to some extent by reported data.

B. Although the study title refers to "major items," those secondary items of sufficient importance to be included in an existing serial number management system are also addressed. Major items include Class VII end items and any Class V end items which

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would properly be Class VII, except for their explosive nature. Secondary items are those items which do not qualify as major items.

C. Accountability, statutory, and law enforcement requirements are not a part of the study but have been mentioned to make the reader aware that serial numbers are used for purposes other than management at the wholesale/national level.

D. This study examined the Small Arms Accounting System (SAAS), the Standard Army Maintenance System (SAMS), The Army Maintenance Management System (TAMMS), the Aviation Component Intensive Management System (ACIMS), the Armor Management Information System - Logistics (ARMIS-LOG), the tail number control of aircraft, and the USA numbering system for vehicles.

E. A determination of factors significant in the selection of items to be designated as appropriate for serial number control systems is included. A serial number control or management system for items which are not maintenance-significant was not considered necessary; thus, will not be studied.

F. The study has been conducted primarily through document research, insofar as possible, to conserve travel funds.

V. Assumptions

None.

VI. Current serial number systems

Each of the individual serial number reporting systems now in existence for the Army is described in the following paragraphs:

A. Small Arms Accounting System

The Small Arms Accounting System is an automated management information system which records the last known owner or the accountable property book on which each small arm was last entered. It is generally conceded from a supply management point of view that maintenance of this register of serial numbers is not cost effective. There is no data here useful for management purposes, e.g., the number of rounds a machine gun has fired or how many hours it has been in operation. It is public policy for the Army to maintain this register for all of the military services so that the Army's Criminal Investigation Division and the Federal Bureau of Investigation can trace lost or missing items. The system can identify as government-owned any items which were lost or stolen so that those weaknesses in procedures that contributed to the loss can be remedied. This system meets the requirements of public policy but not the needs of supply management. The information collected is simply insufficient to make it useful for supply management purposes. The items are often very numerous, e.g., the M16 Rifle. There are so many of these under government control that tracking configuration of each by serial number would be a burden on data processing facilities. Additionally, the configuration of these weapons normally

is not subject to modification. Small arms are seldom the recipients of modification work orders after fielding. To add larger weapon items and management-type data, e.g., number of rounds fired, etc., would make the system unwieldy as well as creating duplication with The Army Maintenance Management System (TAMMS). So, this study will not deal further with the Small Arms Accounting System. Attached as Appendix A is an extract of a report by the Department of the Army Asset Control Task Force, June 1972, which discusses needs for and objections to a small arms registry.

B. Maintenance Management Systems

1. With the advent of widespread use of computers in the military, the Army attempted to automate almost all repair parts consumption data in a maintenance management system called The Army Equipment Record System (TAERS). The volume of reported data overwhelmed the capacity of the computers to transform such data into meaningful management reports. The maintenance managers themselves were also overburdened by the volume; consequently, much of the data was never used for its intended purposes.

2. The Army corrected the problem rather rapidly with a replacement system called The Army Maintenance Management System (TAMMS). In this system, reporting was simplified and the item range was substantially reduced from that of TAERS. TAMMS data is judged to be fairly accurate. One must bear in mind that this data is reported by maintenance units and by using units via a manually

prepared card which may be either sent by AUTODIN or mailed to the Materiel Readiness Support Agency (MRSA). TAMMS is a manual reporting system used to provide information about actions which affect the availability of equipment. Data concerning maintenance actions, ownership, usage, and causes of loss are all reported. The data base for this system contained information about 4,743 different National Stock Numbers as of April 1981. TAMMS is currently being replaced by a new system, the Standard Army Maintenance System (SAMS), which is an automated system designed to accomplish work ordering, cost accounting, and budgeting for use by maintenance personnel at all levels. About 95% of the data which today is being reported manually will become a by-product of this automated management system. At the present time, the Computer Systems Command is writing software for the retail portion of SAMS, which should be fully implemented in 1986. The wholesale portion will make use of a data base management system, so that the materiel readiness commands of the Army Materiel Development and Readiness Command can access the data base and obtain whatever information is needed in whatever format they specify. This portion is currently being programmed and is scheduled for implementation in November 1981. Initially, the data base primarily will contain information received from TAMMS reports; but, as SAMS is implemented, its data transmissions will supplant the reports of the older TAMMS.

3.   The TAMMS-SAMS data identifies the last registered owner of an item and provides other specified usage data such as

which modification work orders have been applied to specific end items by serial number. It also provides usage data, such as: number of hours flown, number of rounds fired, number of miles driven, or age of the equipment. TAMMS-SAMS is truly a serial number control system which can contribute to supply management. For very complex items, e.g., the tanks in the preceding example, minor variations in end item configuration can be recorded by serial number at the materiel readiness commands. Tanks with a certain range of serial numbers can be configured with optical rangefinders, while tanks with other types of rangefinders can be assigned different ranges of serial numbers.

C. Armor Management Information System - Logistics

The Armor Management Information System - Logistics (ARMIS-LOG) is not a new serial number reporting system but rather a system designed to purify TAMMS-SAMS data and to use the purified data to better manage armored vehicles and tanks. The Continuing Balance System - Expanded (CBS-X) is used to track supply transactions worldwide for items with Reportable Item Control Codes of either "1" or "2" and to maintain by unit the on-hand quantities of these items. The ARMIS-LOG compares each unit's balances from the CBS-X files with the items reported by the unit under TAMMS procedures; thus, missing data can be identified and obtained. This ARMIS-LOG routine does not assure the correctness of the reported data but it does assure that the correct quantity of data is reported. Other machine edits can identify some incorrect data.

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D. The USA numbering system

1. Our states require each vehicle to have a license plate installed on it. Likewise, the Federal Government requires that each military vehicle display the military equivalent of a civilian license number on it. This is the "USA" number. The register for these numbers is maintained by the Materiel Readiness Support Activity which is the same organization which is the repository for TAMMS data. USA numbers are significant in that the first two characters identify the type of vehicle, the last four being numbers designed to serve the same function as a serial number. This system contributes to law enforcement but does nothing for supply management.

2. The USA numbering system is considered to be separate and apart from TAMMS-SAMS data. However, it is a very closely related system, operated by the same organization which has wholesale proponency for TAMMS-SAMS, and it can be combined into the TAMMS-SAMS data base without any known impact. The decision to merge the two systems should rest with data processing personnel with a cost-benefit analysis being the principal consideration.

E. The Aircraft Tail Number System

1. The tail numbers of all aircraft and their location and condition is maintained at the Troop Support and Aviation Materiel Readiness Command (TSARCOM) by data reported monthly from

the field. Sixty-one different models and series of aircraft are reported.

2.   These reports contain information useful for evaluating the readiness of Army aircraft over the preceding month.

3.   The management of aircraft by the Army is similar to the management procedures for all other major items used by the Army, in that accountability is lost by TSARCOM when the aircraft leaves wholesale stock. The US Air Force uses a very different approach.

4.   The Air Force Logistics Command Aerospace Vehicle Distribution Office located in Headquarters, Air Force Logistics Command, is responsible for the assignment and distribution of aerospace vehicles (all aircraft, all missiles, except tactical air intercept and air-to-ground missiles/major components) allocated to all authorized recipients.

5.   Assignments and reassignments of aerospace vehicles between major air commands, to and from the Air National Guard and to non-Air Force activities, is made only upon receipt of instructions from the Aerospace Vehicle Distribution Office. The basic planning document for the assignment and distribution of aerospace vehicles is the US Air Force Program, "Aerospace Vehicles and Flying Hours," published by Headquarters, US Air Force.

6. Assignments and reassignments of aerospace vehicles are based on allocations issued by the Deputy Director of Forces, Directorate of Programs, Headquarters, US Air Force. Headquarters, Air Force Logistics Command, Aerospace Vehicle Distribution Office maintains the stock record account for aerospace vehicles procured by or assigned to Air Force and Air National Guard organizations.

7. Transfer of assignment for aerospace vehicles to or from major commands is effected by issuance of an assignment directive by the Aerospace Vehicle Distribution Office. Assignment directives cover one or a multiple number of aerospace vehicles.

8. At base level, control of aerospace vehicles by the Air Force Logistics Command is accomplished through base aerospace vehicle distribution officers who insure the necessary coordination, report preparation, certification of condition, completeness of equipment, serviceability, and accuracy of the record of flying hours and discrepancies.

9. Accountable property records showing worldwide density of aerospace vehicles are maintained by the Aerospace Vehicle Distribution Office. Property accountability is assumed upon receipt of a materiel inspection and receiving report prepared at the time of acceptance of new aerospace vehicles from production, or upon receipt of a properly executed release/receipt document transferring the vehicle between an outside activity and the Air Force.

10. Aerospace vehicles are accounted for by the Aerospace Vehicle Distribution Office as long as they remain assigned to an Air Force or Air National Guard activity or until a properly executed document is received for transfer or termination of property accountability. Detailed instructions covering the Worldwide Aerospace Vehicle Inventory Reporting System are contained in Air Force Regulation 65-110.

F. Aviation Component Intensive Management System

1. The Aviation Component Intensive Management System (ACIMS) is the only system used by the Army to report condition and usage data concerning both installed and stocked aircraft parts and components. The list of reportable items consists of items which must be replaced periodically (time change components) to insure safety of flight. Reports are prepared manually, after which they may be sent by AUTODIN or mail to TSARCOM, where they are audited for obvious errors and subsequently entered into the data files. As of April 1981 there were 157 items on the ACIMS list.

2. The ACIMS is not a stand-alone management system. It is used in connection with the Aviation Intensive Management Item (AIMI) system and enhances the process of negotiating the return of these items for inspection, repair, or calibration. The ACIMS data is used principally by the item managers, while the TAMMS-SAMS data is used principally by the maintenance managers.

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VII. Assignment of serial numbers

A. The Army has no regulatory guidance for preventing the assignment of duplicate serial numbers when like items are being procured from more than one manufacturer. Although commercial-type items may be assigned the same Line Item Number (LIN), the models of different manufacturers are assigned different National Item Identification Numbers; therefore, duplication of serial numbers is not a problem.

B. The word "serial" is defined by Webster's New World Dictionary as "1. Of, arranged in, or forming a series.....". It is the opinion of the writer that the term "serial number" is sufficiently well understood by those who may affect their assignment so that no regulation specifying a procedure designed to prevent duplication is necessary. Those in charge of assignments realize that the use of the same number more than once destroys the purpose of serial numbers.

C. Placement of serial numbers is controlled by the applicable drawings when an item is manufactured specifically for the Army and by the manufacturer's drawings for commercial-type items.

VIII. Embedding significant data

A. American automobile manufacturers use the first five positions of their serial numbers to encode the model year and series of each car. This is needed by insurance underwriters and by

those authorities who levy personal property taxes. It is not necessarily data which is required by the manufacturers themselves, since their data base could provide the same information if only the remaining digits of the serial number were known. Underwriters and tax accessors lack entree to a manufacturer's data base; consequently, there is a need for the embedded data.

B. Most of the Army's items are manufactured to the same specifications and are assigned the same National Item Identification Number. Configuration changes occur via modification work orders after the item has been manufactured and serially numbered. Therefore, this type of configuration change cannot be embedded in a serial number.

C. It might be advantageous to record a code for the manufacturer of a vehicle's engine into the serial number of a vehicle. However, if the engine were later replaced by an engine from a different manufacturer, the information conveyed by the serial number would be in error, a situation worse than no information at all.

D. Embedding significant data creates one important disadvantage--it lengthens the serial number. Serial numbers must be entered on property books, on hand receipts, and on many transaction documents at troop unit level. When many items are turned in for repair, the serial number is entered on the work order. Subsequently, it must be recopied to TAMMS reports. After that it must be keypunched prior to entry into an automated system. The error

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rate is proportional to the length, i.e., the longer the number, the more possibilities for miscopying.

E.   Adding significant data to an already existing serial number is not a common commercial practice, but it does occur. If an item is sent to a commercial facility for overhaul or modification, the contractor may add a prefix or suffix to the number to indicate the nature of the work done in his shop. When this occurs, a large amount of manual effort is required to match the new serial number to the old number.

IX. Criteria for management

Criteria for designating those items that can be controlled/managed by serial number in a cost effective manner are discussed in the following paragraphs.

A.   Assignment of serial numbers should be made to all items for which serial number accounting is required of Army units (classified, pilferable, and sensitive items).   All items for which failures may be largely related to a specific production or overhaul batch should also receive serial numbers or lot numbers. This does not mean that all such items should be controlled or managed by their serial numbers.

B.   Management by serial number should be limited to those items that have a medium-to-high probability (in the developer's judgment) of being modified or modernized in future years and to

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items which require replacement or depot level maintenance after a prescribed number of miles, hours, or rounds. It is essential in the management process for higher headquarters to be aware of items requiring the application of modification work orders so that corrective action can be taken, and to identify those items which require periodic maintenance.

C. Reparable items should not automatically be controlled/ managed by serial numbers. The Commodity Command Standard System uses a statistical program to forecast return of reparables for overhaul based upon the historical return rate and the present issue rate. This program is excellent for those secondary items which fail randomly since this collection of failure data provides a statistical basis for forecasting random failures. If depot level maintenance has been prescribed for items based on their usage rate, a study of the actual usage of each item by serial number does provide a more realistic forecast of returns as shown by the ACIMS/AIMI systems.

X. Cost effectiveness

It remains a subjective judgment whether the management of a particular National Item Identification Number by its serial numbers is cost effective. Troops who initiate the reports generally have sufficient time to fill out a few more forms. Their supervisors generally have the time needed to encourage the troops in this respect. Keypunching and AUTODIN transmission take little time. Pro-

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cessing by MRSA of a few additional items is not very time-consuming. And, although the time needed to purify obviously erroneous data requires many hours, there are relatively few employees engaged in this task. Still, morale suffers because troop units never see any direct benefits to be received from "filling out another form." If serial number reporting is more than slightly increased, it is also possible to cause an increase in workload such that additional personnel must be hired and/or additional data processing or transmission equipment procured.

XI. Tracing defective items

A. There are two types of defective items--those with random defects which were not identified by the quality control and inspection procedures of the manufacturer and those which are manufactured to defective specifications or which contain defects in 100 percent of the items but were not identified because of faulty quality control and inspection procedures.

B. Serial number control systems are useless in tracing randomly defective items because no way exists to identify those particular serially numbered items which are defective. The tracing of such defective items is impossible; they can only be identified as defective by their users.

C. Items which are 100 percent defective are generally items which are newly developed and for which quality control and testing procedures are also newly developed. Normally, initial

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production rates are low and introduction into the Army supply system is slow. After a short period of use the defect is noted. It is believed that the discovery rate for such defects is inversely proportional to the time an item has been fielded. The Commodity Command Standard System retains two years of issue history and the Standard Army Intermediate Logistics System retains its issue history for three years, thus making it possible to trace items without use of a serial number control system. The defects generally come to light on the first items to be fielded while the remainder of the materiel is still undergoing manufacture or remains in the transportation pipeline.

XII. Concept of one standard system

A. Minimum data required for one standard serial number management system is displayed below:

Type	Data to be reported	Frequency
LIN-related item	Maintenance actions, ownership changes, usage, causes of loss	Monthly
Vehicle end item	Ownership changes, losses	Monthly
Aircraft end item	Availability data	Monthly
Time change components	Installations/removals, maintenance actions, owner-ship changes, usage	Monthly
Small arms items	ownership changes	Monthly

B. In the 1940's and early 1950's, each Army technical service operated its own cataloging system, except for the Corps of Engineers, which operated two separate commodity-dependent systems. The Federal Catalog System was developed by standardizing technical service-unique data elements and relating all of these elements to a Federal Stock Number and Item Description. The nature of cataloging is such that a vast amount of effort is required initially when a new item enters the system; thereafter, changes to the data for each stock number occur only rarely. So, these two characteristics of one standard catalog system appear salient to this study: (1) the standard system contains almost all of the data elements of the combined original systems, and (2) except during initialization the

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number of inputs is very small when compared to the total quantity of data in the file. If the concept of implementing one standard serial number management system were to be based upon the creation of the Federal Catalog System, several pertinent questions arise.

1.   Is it desireable to include availability data for most LIN-related items including small arms? The exception reporting of readiness under AR 220-1 adequately fulfills this need for all commodities except aircraft. Yet, if the concept of the Federal Catalog System is to be followed, the full range of data elements should be collected and filed for every item.

2.   "Installations and removals" for time change components equate to "issues and turn-ins" for most major items. Should the reporting of these elements be included for small arms and other major items? Non-serial number data concerning issues and turn-ins is already available in the Continuing Balance System - Expanded. Again, if the Federal Catalog System concept is to be observed, all data for all items should be collected.

3.   Would such a data mass be more useful than the relatively limited amount of data collected in our current systems? In the opinion of the writer, the answer to this question and the preceding two questions is negative. Furthermore, the additional data is of the type which fails to lend itself to automated reporting procedures, as does most of the TAMMS-SAMS data.

4. Another disadvantage of implementing such a standard system is that, unlike the Federal Catalog System, the reporting of serial number data is a process in which the data reported over the years is large when compared to the initial input.

C. There is a second possible concept of one standard serial number system. Operational responsibility for the current systems could be assigned to one activity, which would collect and file the data received from a "standard" serial number reporting system, consisting of a TAMMS subsystem, an ACIMS subsystem, etc. There is a strong disadvantage to this type of standardization, which in the minds of many readers will not be considered standardization at all. It would remove operational responsibility from those organizations to which it is presently assigned. The present assignments appear to be logical - the Materiel Readiness Support Activity for maintenance data, the Troop Support and Aviation Materiel Readiness Command for aviation data, and the Armament Materiel Readiness Command for small arms data. Thus, it is the writer's opinion that such "standardization" cannot be supported.

XIII. A look into the future

There are currently two breakthroughs in technology that look promising for the area of serial number control/management.

A. Memories for "pocket" computers have been developed. They are non-volatile, meaning that the computers do not lose their memories when the power switch is turned off. Microprocessors are

presently being used in automobiles to control emissions and to maximize fuel mileage. Using similar electronic components, it has now become possible to build an automated log book into a vehicle so that the vehicle knows how many miles it has been driven, knows the serial number of its engines and when it was installed, knows the number of hours on the engine and how much the engine has been stressed, knows the serial number of its gun tube and how many rounds have been fired, and contains whatever other data is needed by maintenance managers. The data could be dumped and transceived regularly.

B. The second breakthrough is in the area of computer programing. SAMS can be enhanced to ask the terminal operator questions concerning the principal components of specified major items, and reports (including the serial number of the component) could be generated along with the reports on the major item itself. This should be considered as an enhancement to be made after SAMS is fully implemented in 1986. If attempted at the present time, implementation of SAMS might be delayed.

XIV. Findings

There is no need for issue of a DARCOM regulation covering the assignment of serial numbers. The greatest difficulty at the present time is in obtaining good data reported from the field, and it is anticipated that the reports will improve upon implementation of SAMS. The SAMS is a large, complex, maintenance management and

information system, which will maintain a record of all support and customer activities, maintain a historical and current status record of equipment, and maintain a record of recall services required and one-time repair expenditure limits. It can receive modification requirements, determine which support activities require modification kits, and establish the required rate of modification applications for each support activity. It will maintain a record of age, usage, warranty, and manufacturer data on selected equipment and report usage to higher levels. It will have the capability to develop a candidate list for depot maintenance.

XV. Conclusions

There is no significant overlap or duplication between the different serial number control/management systems. Each was designed for its own purpose and collects only data unique to that purpose.

XVI. Recommendations

A. Materiel selected for management by serial number should be limited to those items that have a medium-to-high probability of being modified or modernized in future years and to those reparable items which require replacement or depot level maintenance after a prescribed period of usage.

B. Design of one "standard" serial number control/ management system is not necessary. The only existing systems which

have some degree of compatibility with respect to reported data are ACIMS and TAMMS-SAMS.

C. After SAMS is fully implemented in 1986, a determination should be made concerning the practicality of absorbing all or selected portions of ACIMS into the SAMS data base.

APPENDIX A

EXTRACT

Report of the Department of the Army, Office of the Deputy Chief of Staff for
Logistics, Asset Control Task Force, Volume II, Chapter 3, June 1972.

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Army regulations do not establish a requirement for serial number accounting

of property in storage for which accounting is by stock record; nor, is there any

statutory requirement for registering of small arms owned by the Army. It is

common practice for arms manufacturers to keep records of weapons produced by

serial number.

A check with Colt Industries revealed that a register is maintained for

every weapon manufactured. The registry cross references the weapon serial

number to the shipping invoice number. The shipping invoice number indicates

the disposition of the weapon in terms of where, when and who. Arms manufac-

turers are required to keep serial number data on small arms in accordance with

the gun control law of 1968. However, Colt Industries has always retained a

serial number register of all weapons manufactured by them. It was estimated

that approximately 6 to 8 inquiries per day for serial number data are received

and processed. The majority of the inquiries are from law enforcement agencies.

Consequently, it can generally be assumed that some form of registry exists for

small arms. However, access to this registry data is subject to the policies

of the specific manufacturer and only first destination information is available.

Small arms are normally shipped from the manufacturer to an Army depot and

accountability is recorded on stock records by quantity. Shipping containers

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are opened to verify the quanitities received; however, weapons normally are not deprocessed to determine serial numbers. Approximately 1,000,000 weapons entered the Army inventory during the past 18 months. Approximately 150,000 weapons moved through the depot system for rebuild during this period of time and approximately 400,000 left the Army inventory through sales or disposal. This represents only a portion of the volume of weapons moving through the Army inventory which includes approximately 4,000,000 weapons. It does not include the thousands of field returns and issues. For example, during calendar year 71, USAREUR estimates that 372,000 weapons were issued and 336,000 weapons turned in to their depot system. It is pointed out that this volume is not representative of normal activity, because much of this volume is a result of the M14/M16 rifle exchange program.

The work load involved in deprocessing and reprocessing multi-pack containers to record serial numbers is formidable. As previously indicated in the description of inventory accounting, serial number data is not required to account for weapons in storage, because accounting records and inventory counts are accomplished by quantity. Serial numbers do become important when a weapon is missing. It is important to investigative agencies to know the serial number of the weapon for which they are looking. Conversely, when a weapon is recovered, it is desirable to trace it back to the source to identify the weakness in the system which allowed the loss to occur. In this regard, the Office of the Provost Marshal General submitted a staff study in July of 1969 to DCSLOG which recommended establishment by WECOM of a "small arms information registry" on the basis that it would significantly aid in criminal investigation and prosecution. There are approximately 1200 inquiries per year from criminal investigation agencies for small arms serial number data.

The study proposed the following three alternative systems: Small Arms Registry - 1. This proposal would establish a central registry of all small arms entering the Army inventory from procurement subsequent to a specific starting date. This would be accomplished by requiring the manufacturer to provide a deck of cards for each weapon procured and send one to WECOM showing the date and destination of the weapon. The rest of the cards will be shipped with the weapon on the exterior of the packing crate. As the weapon is received by subsequent accountable activities, a card is to be submitted to the central registry. The estimated annual cost of this procedure was $423,594.

Small Arms Registry - 2. This proposal is the same as the above, except that card decks would be created and registration accomplished for all small arms in storage and in use in addition to those entering the supply system. The estimated cost for this concept was $2,863,000 initial cost and $423,594 annual cost.

Small Arms Registry - 3. This proposal would collect the same data as proposal number 2, except the central data file at WECOM would be automated. The estimated cost of this concept was $3,500,000.

The DCSLOG position rejected the proposal based on a cost benefit relationship using a 1968 statistical base. Of the 1331 weapons lost, 135 were lost from sources where serial numbers were not kept. Forty-five of the weapons were recovered without use of the serial nubmers. The value of the 90 weapons not recovered was an insignificant amount when compared to the cost of establishing and maintaining the central weapons registry. A recent check of losses sub-stantiates this position on a cost basis. A cost analysis made by this study group indicates a probable cost of approximately $8,000,000 (see TAB A). Out of the AMC small arms inventory of 2,000,000 weapons, there were only 6 reported

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as missing on Blue Bell reports in accordance with the provisions of AR 1-55 during 1971. There were no suspected thefts or mysterious disappearances of weapons reported by USAREUR depots during the highly active CY 71 period.

A review of Blue Bell reports indicates that the majority of known weapons losses through theft and mysterious disappearances occur where property is in use as opposed to property in storage (see TAB B). Consequently, accounting by serial numbers cannot be justified on a cost basis.

In view of this fact, the Provost Marshal General was asked for a position on the need for a central serial registry. The PMG position is summarized in the following extracts from the PMG response:

"It is realized that limitations in funds and manpower restrict Army programs. For the purpose of protecting small arms, however, the 'stakes' go beyond normal economic considerations. While record keeping is expensive and burdensome, it does not seem logical to allow cost to be the deciding factor concerning a situation which provides criminals an opportunity to steal and then threaten innocent persons with US military weapons. In a supply system which permits voluminous inventory adjustments, as has been pointed out by recent DOD audits, a step toward tightening controls over sensitive items seems not only desirable but imperative. Experience has shown that military type weapons recovered or confiscated by law enforcement agencies cannot be determined to be military property due to inadequate means of identification within the service. In some cases, this inability results in a felon being released for lack of a proveable theft.

Based on the above considerations, this office maintains that a procedure is necessary whereby a weapon can be traced, by serial number, from manufacturer to user and from user to disposal facility. This procedure should be established so that in the event theft or loss is indicated at any point within the system,

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positive identification of the weapon can be made and that recovered weapons may be identified as Government property."

The Army Audit Agency (AAA) has recently completed an Army wide audit on the control over weapons and ammunition. This audit included 17 active Army activities in CONUS, Alaska and USAREUR, 7 ROTC units and 30 Reserve and National Guard activities. The audit resulted in the following general conclusions:

1. That significant weaknesses existed in both accounting and physical controls over weapons. Some installations were not provided sufficient funds to acquire or maintain adequate facilities. There was a lack of training of personnel maintaining accounting records.

2. A high incidence of weapons losses and thefts continues. During the period 1 Jan 69 - 31 May 71, reported losses and thefts from Active Army and ROTC activities amounted to 8,393 weapons. During this period 2,472 weapons were recovered. During the calendar year 1971, Reserve Component units reported 564 as lost and 312 recovered.

3. While additional guidance and increased emphasis from DA would improve certain conditions, for the most part problems identified did not stem from inadequate procedures but rather from noncompliance with existing policies.

The AAA report provided the recommendation in September 1971 to the DA staff which specifically identified additional guidance requirements indicated in conclusion number 3 above.

Recommendation for DCSLOG included in part a revision to AR 710-2 to include specific guidance for controlling ammo at unit level, and conformance to DODI 4140.35 relative to research of inventory discrepancies. The proposed policy and procedural guidance has been published by temporary means, i.e., letter and message; however, it has not yet been incorporated into the permanent AR.

During the course of this review, Navy and Air Force systems dealing with small arms accountability were studied. Both services obtain their small arms from the Army and generally return them to the Army for disposal. Serial number control is maintained within the Navy and Air Force during the entire time weapons are in their possession. The Navy has an automated central registry for small arms located at an ammunition depot at Crane, Indiana. This registry constitutes a permanent record of all small arms that have been in the Navy inventory since the registration system was initiated 30 months ago. Their record contains the complete audit trail of every Navy activity to which the weapon has been assigned. This record is continually reconciled with user and storage activities. There are approximately 750,000 weapons registered in the file. During the calendar year 1971, there were approximately 2,000 gains and 270,000 losses to the Navy inventory. The average on hand inventory amounts to approximately 420,000 weapons. The Navy receives approximately 800 inquiries per year for serial number data from law enforcement agencies. The registry is staffed with 11 full time employees. This staffing does not include an unknown manning requirement associated with the physical handling of weapons and recording of serial numbers on shipping and receiving documents.

Random inquiries were made to field command activities to determine the impact of imposing a serial number accounting requirement for in-storage weapons. Each activity questioned indicated that it would impose a significant workload for which they are not staffed and would cause a delay in issue and turn-in of weapons. However, USAREUR indicated that serial number control between user units and suppliers probably could be accomplished economically. Some sub-commands in USARPAC and some CONUS installations have indicated that they currently include serial numbers on issue documentation.

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